REMARKS/ARGUMENTS

I. Status of Claims

Claims 1-12 are pending of which claims 1 and 7 are independent. By this amendment, claims 1 and 7 have been amended.

Applicants note with thanks that claims 2-5 and 8-11 are indicated as being allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

II. Drawings

The Examiner failed to indicate whether previously filed drawings have been accepted. Accordingly, the Examiner is kindly requested to confirm the acceptance of the previously filed drawings.

III. Rejections under 35 U.S.C. §103 (a)

A. Claims 1 and 7

Claims 1 and 7 are rejected under 35 U.S.C. §103 (a) as being unpatentable over U.S. Patent No. 6,842,624, to Sarkar et al. (hereinafter Sarkar), in view of U.S. Patent No. 5,513,221 to Parr et al. (hereinafter Parr). Applicants respectfully traverse the rejection.

Before discussing the differences between the cited references and the present application, it is believed to beneficial to first give a brief overview of Applicants' disclosure. In a mobile communication system, channel estimation of radio signals transmitted from a mobile station is necessary for a base station to correctly extract data from the signals received. However, if a mobile station, which transmits radio signals, is moving with a velocity, the Doppler shift effect may cause performance degradation on the actual channel estimation. The Doppler shift effect usually varies with velocities of a mobile station. Hence, in order to remove the Doppler shift effect,

it is necessary that the base station have a velocity estimator for estimating the velocity of a mobile station based on a received signal.

Methods for implementing a velocity estimator are divided into two types, with the first type of methods using an autocorrelation function of a received signal in a time domain and the second type of methods using Discrete Fourier Transform (DFT) in a frequency domain. Conventionally, a velocity estimator is generally disposed in front of a channel estimator and derives an estimation coefficient for the channel estimator after estimating the velocity of the mobile station. Such design, however, makes it impossible for a velocity estimator to have a channel-estimated input signal with improved signal-to-noise ratio. In addition, such design causes no appropriate input to the velocity estimator during CDMA2000 gated mode transmission.

The method and apparatus for velocity estimation disclosed in the present application is designed to overcome the problems described above. Specifically, with respect to the disclosed method and apparatus, a channel estimator feeds a channel-estimated signal into a velocity estimator for velocity estimation using DFT in a frequency domain. The velocity estimator then provides the channel estimator with a channel estimation coefficient for use during channel estimation according to an estimated Doppler shift frequency value. As such, the velocity estimator is able to estimate a velocity based on a signal which is channel-estimated and with an improved signal-to-noise ratio, and can also continuously have the output of the channel estimator as its input during gated transmission.

Claim 1 recites a base station apparatus for estimating a velocity of a mobile station in a mobile communication system. The apparatus comprises:

> a channel estimator for receiving a signal on a radio channel from the mobile station and performing channel estimation using the received signal; and

> a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator, and providing the channel estimator with a channel estimation coefficient for use during channel estimation according to a Doppler shift frequency value estimated from the mobile station when the velocity of the mobile station is unchanged.
> (emphasis added).

Sarkar, the cited primary reference, is directed to a method of controlling transmission power of each mobile user, such that in a multi-access communication system, each user transmits only the minimum power necessary, thereby making the smallest possible contribution to the total noise seen by other user. See abstract, col. 1, lines 32-47 and col. 11, lines 46-57. Hence, Sakar has little relevance to the claimed subject matter, which is related to a velocity estimation technique implemented using DFT in the frequency domain.

Nonetheless, the Examiner cited processor 218 of Fig. 2 and col. 8, lines 34-63 as disclosing a velocity estimator for detecting a power spectrum value of the channel. Applicants respectfully disagree with the Examiner's assessment. Col. 8, lines 34-63 merely recounts a number of known methods for estimating a velocity of a subscriber station (mobile station). Included in the recounted methods disclosed in the cited text are: 1) a method estimating velocity based on the average number of a pilot signal power crossing a given power level per second; 2) a method estimating velocity according to auto-covariance between faded samples; and 3) a method estimating velocity through Doppler frequency estimation, which is not given any specific details that can show any relevance to a velocity estimator for detecting a power spectrum value of the channel. In addition, with respect to processor 218 of Fig. 2, it is merely mentioned as something that can compute the pilot signal envelope of the first method described above.

Consequently, none of the disclosure relates to a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator. Specifically, no power spectrum is mentioned, much less teaching

detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator. Accordingly, contrary to the Examiner's understanding, Sarkar does not disclose, teach, or suggest a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator.

Parr, as a secondary reference, does not cure the deficiency of Sarkar with respect to a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator. Specifically, the velocity estimation method disclosed in Parr is strictly based on time-domain analysis (see the speed estimate formula listed in col. 9, lines 15-15), as opposed to DFT analysis in the frequency-domain related to power spectrum across frequencies, upon which the claimed velocity estimator bases to estimate a velocity .

To be more specific, Parr's method derives the velocity at time t+1 from the velocity at time t, using a filtering constant and a phase difference between two tap-setting phases to modify the velocity at time t to arrive at the velocity at time t+1. See col. 9, lines 35-35 and col. 13:58 –col. 14: 5. Hence, Parr's velocity estimation scheme is strictly time-domain based, rather than frequency-domain based, much less based on power spectrum across frequencies. Consequently, Parr does not even disclose, teach, or suggest a velocity estimator for detecting a power spectrum value of a signal, much less disclosing, teaching, or suggesting a velocity estimator for detecting a power spectrum value of **the channel-estimated signal outputted from the channel estimator**, as claimed.

Since Parr does not cure the deficiency of Sarkar with respect to a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator, Applicants need not further discuss Parr with respect to the patentability of claim 1 and rebut the Examiner's contention concerning other elements recited in claim 1.

Accordingly, Sarkar and Parr, taken singly or in combination, does not disclose, teach, or suggest the subject matter recited in claim 1, particularly, a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator. Accordingly, the rejection of claim 1 therefore should be withdrawn.

Claim 7 contains similar recitation to claim 1. Specifically, claim 7 recites the step of detecting a power spectrum value from the channel-estimated signal, which as discussed above, is not disclosed, taught, or suggested by the combination of Sarkar and Parr. Accordingly, claim 7 is also believed to be allowable over Sarkar and Parr. The rejection of claim 7 therefore should also be withdrawn.

B. Claims 6 and 12

Claims 6 and 12 are rejected under 35 U.S.C. §103 (a) as being unpatentable over Sarkar in view of Parr, further in view of U.S. Patent No. 6,006,245 to Thayer. Applicants respectfully traverse the rejection.

Claims 6 and 12 depend from independent claims 1 and 7 respectively, and thus inherits all the subject matter from the independent claims. Thayer is merely cited for disclosing Discrete Fourier Transform (DFT). Thayer, however, is not related to velocity estimation, and thus does not cure the deficiency of both Sarkar and Thayer with respect to a velocity estimator for detecting a power spectrum value of the channel-estimated signal outputted from the channel estimator of claim 1 or the step of detecting a power spectrum value from the channel-estimated signal of claim 7, in the context of velocity estimation.

Accordingly, dependent claims 6 and 12 are allowable over the combination of Sarkar, Parr and Thayer. Their rejection therefore should be withdrawn.

IV. Allowable Subject Matter

Applicants thank the Examiner for indicating that claims 2-5 and 8-11 are allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

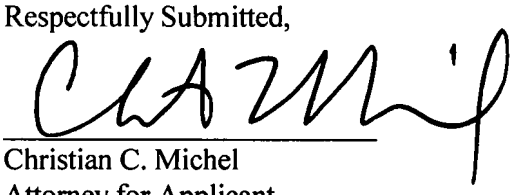
In view of the above stated remarks and arguments stated in connection with the rejection of claims 1 and 7, Applicants believe that claims 2-5 and 8-11 are in condition for allowance in their current dependent form by virtue of their dependence from claims 1 and 7, respectively. Accordingly, Applicants respectfully hold amending these claims into dependent form in abeyance until the Examiner has had an opportunity to consider the above comments.

V. Conclusion

In view of the above, it is believed that this application is in condition for allowance and notice to this effect is respectfully requested. Should the Examiner have any questions, the Examiner is invited to contact the undersigned at the telephone number indicated below.

Should any/additional fees be required, the Director is hereby authorized to charge the fees to Deposit Account No. 18-2220.

Respectfully Submitted,



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